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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H01F 13/00, H04N 9/29 | A2

(11) International Publication Number: WO 97/08718

(43) International Publication Date: 6 March 1997 (06.03.97)

(21) International Application Number: PCT/IB96/00821

(22) International Filing Date: 21 August 1996 (21.08.96)

(30) Priority Data:
95202273.9 23 August 1995 (23.08.95) EP
(34) Countries for which the regional or international application was filed: NL et al.

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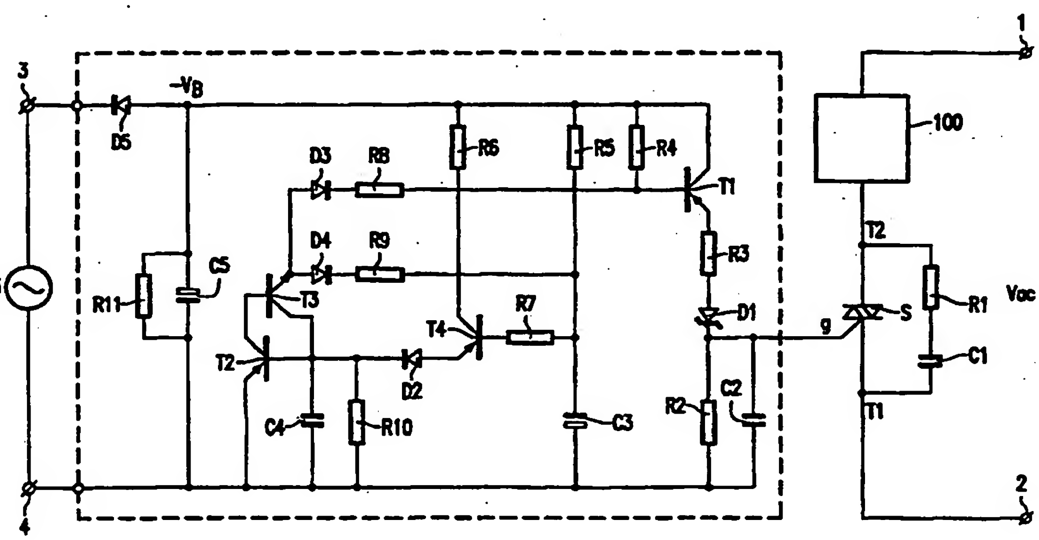
(81) Designated States: CN, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: DISCONNECTABLE DEGAUSSING



(57) Abstract

Degaussing arrangement provided with a series circuit of a degaussing coil (Ld), a current-determining circuit (P1, P2) for determining a starting current through the degaussing coil (Ld) and for subsequently causing the current (Id) through the degaussing coil (Ld) to decrease to a residual value, and a triac (S) for switching off the current (Id) through the degaussing coil (Ld) and through the current-determining circuit. The degaussing arrangement is further provided with a control circuit (200) for switching on and switching off the triac (S), and with a time-determining circuit (C38; C3; 30) for determining a period of time. After the triac (S) is switched on, the triac (S) is not switched off until after the period of time has elapsed. Extra facilities have been provided to control the triac (S) as optimally as possible and to render the degaussing arrangement insensitive to mains interruptions and display tube flashes.

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Disconnectable degaussing.

The invention relates to a degaussing arrangement comprising a series circuit, coupled between terminals of an AC voltage source, of a degaussing coil, current-determining means for determining a starting current through the degaussing coil and for subsequently causing a current through the degaussing coil to decrease to a residual value, a switching element for interrupting the current in the degaussing coil, and a control circuit for switching off the switching element after a given period of time has elapsed after presentation of an AC voltage supplied by the AC voltage source.

The invention also relates to a display device provided with such a degaussing arrangement.

Degaussing arrangements are notably used for degaussing a picture display tube and metal objects in a picture display device.

A degaussing arrangement of this type is known from JP-A-3/98393. The known degaussing arrangement is provided with a degaussing coil arranged around the cone of the display tube for generating an electromagnetic field intended to degauss metal objects in the display tube itself or in its vicinity. To obtain a satisfactory degaussing effect, this electromagnetic field and hence the current through the degaussing coil should comply with given requirements. These requirements are: during a degaussing start, the value of a starting current through the degaussing coil should be sufficiently large to degauss the metal objects adequately, the rate at which the current through the degaussing coil decreases should not be too large, and a residual current through the degaussing coil should be smaller than a given value so as to achieve a sufficiently small residual magnetization.

To meet these requirements, the known degaussing arrangement further comprises a resistor having a positive temperature coefficient (PTC) which is arranged in series with the degaussing coil. A strength of the generated field during the degaussing start is dependent, inter alia, on the number of turns of the degaussing coil and on the value of the starting current in the degaussing coil. The value of the starting current is determined by a series circuit of the resistor of the PTC in a cold state and a resistor of the degaussing coil. Since these resistors have relatively small values, a large starting current will be produced.

Due to the starting current, the PTC will heat up and gradually assume a higher resistance; as a result, the current through the degaussing coil decreases slowly. Eventually, a final situation will be reached in which the resistance of the PTC does not further increase and the relatively small residual current flows through the degaussing coil.

The known degaussing arrangement further includes a switching element which is arranged between the PTC and the degaussing coil. In a first state, the switching element connects the PTC to a terminal of the degaussing coil which is not connected to the AC voltage source, so that the current through the PTC flows through the degaussing coil. In a second state, the switching element connects the PTC to a terminal of the degaussing coil which is connected to the AC voltage source, so that the current through the PTC does not flow through the degaussing coil. The switching element is a bimetal which is thermally coupled to the PTC. The bimetal is in its first state when the PTC has a temperature below a given value. The bimetal is in its second state when the PTC has a temperature above a given value. To explain the operation of the known circuit, a starting situation is chosen in which the AC voltage is absent and the PTC is cold. If the AC voltage becomes active, the starting current will flow through the degaussing coil. Consequently, the PTC is heated and the current through the degaussing coil decreases. At a given temperature of the PTC, the bimetal changes from the first state to the second state and the current through the degaussing coil is switched off. In the second state, a final current flows through the PTC so as to maintain the temperature of the PTC at such a high value that the bimetal remains in its second state. The existing circuit has the drawback that the final current in the PTC is necessary, which notably leads to unwanted power consumption in the standby state of a picture display device. Moreover, the bimetal should certainly be switched over to the second state before the temperature of the PTC has become stable. This means that the current through the degaussing coil is already switched off before the minimal value is reached, which may have a detrimental influence on the degaussing quality.

It is an object of the invention to provide a disconnectable degaussing having a very low power consumption after degaussing has taken place.

To this end, a first aspect of the invention provides a degaussing arrangement as defined in claim 1.

A second aspect of the invention provides a picture display device including a degaussing arrangement as defined in claim 10.

Advantageous embodiments of the invention are described in the

dependent claims.

In picture display devices, the AC voltage used for degaussing is usually the mains voltage. It is desirable that the display tube is degaussed whenever the picture display device is provided with the mains voltage. The picture display device is provided with the mains voltage, for example, by switching on a mains switch. A control circuit detects whether the AC voltage becomes active and switches on a triac. A time-determining circuit determines a period in which the triac is subsequently maintained conducting. After the given period, the triac is switched off and degaussing coil and PTC become currentless (in the invention, the temperature of the PTC need not be maintained at a high value). The degaussing arrangement substantially does not consume any power from the AC voltage. This is notably important if the picture display device is subsequently brought to a standby state in which a very small power consumption from the mains is desirable. Further advantages of the use of a triac are: a triac is not a mechanical element and thus less liable to wear and does not produce any noise during a switching action; a triac switches off during zero crossings. A mechanical switching element may switch off at any arbitrary moment, resulting in an interruption of the current through the degaussing coil, which causes high voltages.

An embodiment of the degaussing arrangement as claimed in claim 2 has the advantage that the length of the given period of time may be chosen to be such that the PTC in series with the degaussing coil has reached its final temperature, while a minimal residual current flows through the degaussing coil. In the known degaussing arrangement, the length of the period of time is limited because the bimetal should be switched over before the PTC has reached its final temperature.

An embodiment of the degaussing arrangement as claimed in claim 5 has the advantage that the time-determining circuit is brought rapidly to its starting state after a degaussing action has finished, so that a subsequent degaussing action covers the desired period of time again.

An embodiment of the degaussing arrangement as claimed in claim 6 has the advantage that the time-determining circuit is brought to its starting state before a degaussing action is started, so that the subsequent degaussing action covers the desired period of time again.

An embodiment of the degaussing arrangement as claimed in claim 7 is based on the recognition that it is important for a satisfactory operation of the circuit that the control of the gate of the triac is effected at a negative voltage and with a sufficient current. At a positive control of the gate of the triac, it does not function symmetrically. In this case,

a trigger current required in the gate of the triac for switching on the triac depends on the polarity of the voltage across terminals of the triac. Upon negative control of its gate, the triac can be triggered at a substantially equal gate current, independent of the polarity of the voltage across the terminals. In fact, this asymmetry need not be a problem at positive control, provided that the gate current is always high enough to switch on the triac at both polarities of the voltage across the terminals of the triac. However, in connection with dissipation, it is advantageous to control the triac at a minimal gate current. Upon negative control of the triac, this asymmetrical effect is reduced but has not completely disappeared because there are still small differences in amplitude between the voltage during a positive and a negative duty cycle. A desired result is achieved if the gate is controlled by both a negative voltage and a sufficiently large current.

In an embodiment of the degaussing arrangement as claimed in claim 8, the given period of time generated by the time-determining circuit after a mains dip is in conformity with a thermal time constant of the PTC in series with the degaussing coil. In other words, when a mains dip occurs, the state of the time-determining circuit changes towards a starting state at a rate corresponding to the rate at which the PTC cools down. The degaussing action will last a shorter period of time upon an increase of the mains voltage which occurs before the PTC has cooled down. The degaussing action lasts for such a long time that the degaussing coil is not disconnected before the current through it has decreased to the residual current. This has the advantage that the degaussing action always takes place for a sufficiently long time but not longer than is necessary. For example, a time constant for discharging a capacitor is chosen in relation to the thermal time constant of the PTC. Due to a mains dip, the PTC will start cooling down. If the mains voltage subsequently increases again before the PTC has completely cooled down, it will reach its final temperature more rapidly and thus a shorter degaussing action is required. Therefore, it is no problem if the capacitor has not been discharged completely yet. The period determined by the time-determining circuit may thus decrease in conformity with the thermal time constant of the PTC.

In an embodiment of the degaussing arrangement as claimed in claim 9, a capacitor is coupled between the terminals of the triac. Due to a capacitive coupling of the display tube with the degaussing coil, steep voltage peaks are produced across the degaussing coil and thus also across the triac during internal flashes in the display tube. Also mains spikes may cause steep voltage peaks across the triac. These steep voltage speaks may trigger a triac which has been switched off, so that a large current will flow through the degaussing

coil during half a mains period. The capacitor prevents the triac from being switched on due to these voltage spikes, .

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

In the drawings:

Fig. 1 shows a degaussing arrangement according to the invention,

Fig. 2 shows another degaussing arrangement according to the invention,

Fig. 3 shows yet another degaussing arrangement according to the invention,

Fig. 4 shows a time diagram of a degaussing current which is produced upon erroneous control of the triac, and

Fig. 5 shows another degaussing arrangement according to the invention.

Fig. 1 shows a degaussing arrangement according to the invention. The degaussing arrangement comprises a degaussing circuit 100 (which may comprise the degaussing coil Ld and a PTC P1 in series with the degaussing coil Ld). It is desirable to switch off the degaussing circuit 100 in the standby state of the picture display device so as to minimize the power consumption. This is an important aspect, because consumers are becoming increasingly aware of energy consumption, while moreover legal requirements are being prepared for limiting the power consumption in the standby state. The facilities provided for switching off the degaussing circuit 100 in the standby state may alternatively be used for switching off the degaussing circuit 100 in a normal operating mode of the picture display device. Then, extra requirements are imposed on the degaussing arrangement. In a picture display device which is in operation, it should be ensured that the degaussing action is not interrupted before the current Id through the degaussing coil Ld has reached the small residual value. This is done to ensure that the degaussing action is performed completely and that no visible discoloration is produced on the display screen. Hence, when a degaussing coil Ld is switched off with a triac S, a time circuit is required which disconnects the degaussing coil Ld form after the mains voltage Vac a sufficiently long time. This may deviate from switching off the degaussing action in the standby state of the picture display device. In the latter case, a premature interruption of the degaussing action is not visible on the screen. The resultant magnetization of the display tube may be eliminated by starting a degaussing action upon switching the picture display device from the standby state

to the operating state. Moreover, it is important that a degaussing circuit which has been switched off is not switched on during normal operation after a short mains dip or after voltage spikes across the triac.

The degaussing arrangement comprises a series circuit of a degaussing coil Ld, a thermal resistor having a positive temperature coefficient (PTC) P1, and a triac S connected between a first and a second terminal 1, 2 of an AC voltage source Vac (for example, the mains voltage). A second PTC P2 is arranged parallel to the series circuit of the degaussing coil Ld and the first PTC P1. The second PTC P2 is thermally coupled to the first PTC P1 so as to heat the latter for obtaining an extra small residual current through the degaussing coil Ld. The circuit which comprises the degaussing coil Ld and the PTCs P1, P2 will further be referred to as the degaussing circuit 100. The triac S is switched on and off by means of a control signal Vc via a control input g. A transformer Tr comprises a series circuit of two windings L1, L2 connected between the two terminals 1, 2 of the AC voltage source Vac. The transformer Tr is intended, for example, for generating a standby voltage. The second winding L2 supplies an input voltage Vi for the degaussing arrangement. A series circuit of a resistor R25, a rectifier diode D37 and a smoothing capacitor C37 is connected between terminals of the second winding L2. Moreover, a series circuit of a resistor R29, a resistor R28 and a capacitor C38 is arranged parallel to the smoothing capacitor C37 and a resistor R27. A PNP transistor T41 has an emitter connected to a junction point of the resistor R29 and the resistor R27, a base connected to a junction point of the resistor R29 and the resistor R28, and a collector connected to the control input g of the triac S via a resistor R26. A parallel circuit of a resistor R21 and a capacitor C36 is arranged between the control input g and the terminal T1 of the triac S which is not coupled to the degaussing circuit 100. A terminal T2 of the triac S is connected to the degaussing circuit 100.

The operation of the degaussing arrangement of Fig. 1 will now be described. When the picture display device is switched on, a voltage is built up across the capacitor C37. Since the capacitor C38 is initially not charged, the PNP transistor T41 is conducting and the triac S is thus also conducting. In other words, the degaussing circuit 100 is connected to the AC voltage Vac and a degaussing current Id flows through the degaussing coil Ld. Via the base-emitter junction of transistor T41 and the resistor R28, the capacitor C38 is charged at a time constant which is related to the product of a value of the resistor R38 and the capacitor C38. When the capacitor C38 has been charged sufficiently, transistor T41 will be turned off so that the triac S no longer conducts. The degaussing circuit 100 is

now currentless. The period of time in which the triac S conducts is determined by said time constant (R38*C38). To obtain a satisfactory degaussing of the display tube, this period of time should be sufficiently long so that the residual current through the degaussing coil Ld has decreased sufficiently far before the degaussing circuit 100 is switched off. The control circuit 200 comprises all the parts already shown in Fig. 1, except for the degaussing circuit 100, the triac S and the transformer Tr. The control circuit 200 receives the input voltage Vi from the transformer Tr and applies the control signal Vc to the gate g of the triac S.

Fig. 2 shows another degaussing arrangement according to the invention. This degaussing arrangement is based on the arrangement shown in Fig. 1. Corresponding elements have the same reference numerals. The circuit described below is added to the degaussing arrangement of Fig. 1. A series circuit of a diode D34 and a resistor R24 is coupled between the junction point of the resistor R28 and the capacitor C38 and an emitter of a PNP transistor T43. A collector of the transistor T43 is connected to the other terminal of the capacitor C38. A base of the transistor T43 is connected to a junction point of the resistor R25 and the second winding L2 via a series circuit of a resistor R22, a diode D35 and a resistor R23. A parallel circuit of a resistor R30 and a capacitor C35 is arranged between the collector of the transistor T43 and a junction point of the resistor R22 and the diode D35.

Due to this addition, the operation of the arrangement of Fig. 1 is improved if interruptions of the AC voltage Vac (the mains voltage) occur. Such interruptions, further referred to as mains dips, may be produced, for example, by switching on other loads which are connected to the mains voltage. It is an advantage if the user of a picture display device does not observe any disturbance on the display screen when a short-lasting mains dip occurs (up to approximately 100 ms).

If, generally, a sufficiently long (> 100 ms) mains dip occurs in the degaussing arrangement of Fig. 1, capacitor C37 will be discharged via resistor R27, and capacitor C38 will be discharged via the resistors R28 and R29 to capacitor C37. This means that capacitor C38 is always discharged more slowly than capacitor C37. When the mains voltage increases, while capacitor C38 is not yet fully discharged, transistor T41 will be turned on again (because the voltage at capacitor C37 has been restored almost instantaneously). However, the degaussing arrangement does not remain switched on for the desired minimum period of time, because capacitor C38 is still partly charged. This means that the degaussing circuit 100 is switched off, while the degaussing current Id has not yet decreased to a sufficient extent. In this case, the display tube will be magnetized and color

spots will be produced.

As has been mentioned hereinbefore, it is desirable that the degaussing circuit 100 is not switched off as a result of mains dips having a short period of time. This would also be visible as a color error on the display screen. To this end, the time constant determined by capacitor C37 and resistor R29 should be chosen to be sufficiently large so as to keep the triac S conducting during such a short-lasting mains dip. However, the choice of a larger time constant increases the risk that the capacitor C38 is not yet fully discharged if after slightly longer lasting mains dips the mains voltage increases.

The operation of the additional circuit will now be described. Capacitor (35 will start discharging due to rsistor R30 at the moment that a mains dip appears (or the degaussing arrangement is disconnected from the mains by, for example a mains switch). The voltage on the base of T43 starts decreasing. Transistor T43 starts conducting if the mains dip has a long enough duration and capacitor C38 is discharged rapidly. Non follows a description of three situations which occur depending on the duration of the mains dip. For mains dips having a short duration, the arrangement operates as desired, because the time constant determined by capacitor C37 and resistor R29 is chosen to be sufficiently large to keep the triac S conducting. If the mains interruption lasts slightly longer, capacitor C38 will be discharged completely via transistor T43, and when the mains voltage increases, it will be degaussed for a sufficiently long time. At even longer mains interruptions, both capacitors C37 and C38 are completely discharged and the arrangement has reached its initial state. Hence, a subsequent degaussing action is not switched off until after the desired period of time has elapsed. If the duration of the mains dip approaches the time constant determined by the resistor R30 and the capacitor C35, capacitor C35 is not completely discharged and hence capacitor C38 is neither (in fact, transistor T43 is an emitter follower: the voltage at the emitter follows the voltage at the base). This means that the degaussing circuit 100 is switched off still too early at a given range of durations of mains dips. With the use of the additional circuit of Fig. 2, this range is much smaller than without.

Fig. 3 shows another degaussing arrangement according to the invention. The degaussing arrangement comprises a series circuit of a degaussing circuit 100 and a triac S connected between a first and a second terminal 1, 2 of an AC voltage source Vac. The triac S is switched on and off by means of a control signal Vc via a control input g. A series circuit of a resistor R1 and a capacitor C1 is coupled between the connection terminals T1, T2 of the triac S. An input voltage source Vi supplies a second AC voltage which is derived from the AC voltage Vac, for example, by means of a standby transformer. A first terminal

3 of the input voltage source Vi is connected to a cathode of a diode D5. The anode of diode D5 is connected to the second terminal 4 of the input voltage source Vi via a parallel circuit of a smoothing capacitor C5 and a resistor R11. A negative power supply voltage -Vb is produced across the capacitor C5. A PNP transistor T1 has a collector connected to the power supply voltage -Vb, an emitter connected to the gate g of the triac S via a series circuit of a resistor R3 and a zener diode D1. The gate g of the triac S is further connected to the second terminal 4 of the input voltage source Vi via a parallel circuit of a resistor R2 and a capacitor C2. A resistor R4 is connected between a base and the collector of the transistor T1. The base of the transistor T1 is connected to an emitter of an NPN transistor T3 via a series circuit of a resistor R8 and a diode D3. The transistor T3 has a base connected to a collector of a PNP transistor T2, and a collector connected to a base of the transistor T2. The transistor T2 has an emitter connected to the second terminal 4 of the input voltage source Vi. The base of the transistor T2 is connected to the second terminal 4 of the input voltage source Vi via a parallel circuit of a capacitor C4 and a resistor R10. A PNP transistor T4 has a collector connected to the power supply voltage -Vb via a resistor R6, an emitter connected to the base of transistor T2 via a diode D2, and a base connected, via a resistor R7, to a junction point of a resistor R5 which is connected to the power supply voltage -Vb and a capacitor C3 which is connected to the second terminal 4 of the input voltage source Vi. A series circuit of a diode D4 and a resistor R9 is coupled between the emitter of transistor T3 and the junction point of resistor R5, resistor R7 and capacitor C3.

The operation of this circuit will now be described. When the AC voltage Vac (for example, the mains voltage) increases, a negative power supply voltage -Vb is built up across capacitor C5. This negative power supply voltage -Vb is passed on to the gate g of the triac S via transistor T1, resistor R3 and zener diode D1 for the purpose of switching on the triac S. The period of time during which the triac S remains switched on is determined by the resistor R5 and the capacitor C3. By charging the capacitor C3 through the resistor R5, the transistor T4 will be turned on after a given period of time, so that a thyristor consisting of the transistors T2 and T3 will start conducting. The transistor T1, and hence the triac S are turned off via the diode D3. The capacitor C3 is discharged rapidly via the diode D4. It is thereby achieved that the capacitor C3 is discharged rapidly after a degaussing action. A subsequent degaussing action, which is caused by the increase of the mains voltage Vac after a long-lasting mains dip (or when a mains switch is switched on again), thus has the desired period of time again. If a short-lasting mains dip occurs during a degaussing action (with triac S conducting), the degaussing action is interrupted in that the

mains voltage drops off, but the value of the capacitor C5 can be chosen to be sufficiently large to keep the power supply voltage -Vb at a sufficiently high value long enough, so that the degaussing action is immediately continued when the mains voltage Vac increases. If a short-lasting mains dip occurs after a degaussing action (with triac S not conducting), no increasing power supply voltage -Vb is detected because the value of capacitor C5 can also be chosen to be sufficiently large to maintain the power supply voltage -Vb long enough in this case. An unwanted degaussing action is not started. A degaussing action will be interrupted if a long-lasting mains dip occurs. If the mains dip occurs for a sufficiently long time, the capacitor C3 will be discharged at the moment the mains voltage subsequently increases again, and a subsequent degaussing action lasts sufficiently long. For mains dips having a duration between the above-mentioned short and long-lasting mains dips, the capacitor C3 may not yet have been discharged completely via the resistor R5 at the moment the mains voltage increases again. Consequently, the degaussing action will not last the desired period of time. However, it is possible to choose a time constant for discharging (R9, C3) of the capacitor C3 in relation to a thermal time constant of the PTC P1 in series with the degaussing coil Ld. If the capacitor C3 has not yet been discharged completely, the PTC P1 has not yet cooled down completely so that the PTC P1 reaches its final temperature more rapidly when the mains voltage increases and thus requires a shorter-lasting degaussing action.

The degaussing arrangement is further based on the recognition that it is important for a satisfactory operation of the arrangement that the control at the gate g of the triac S is effected at a negative voltage and with a sufficiently large current. At a positive control of the gate g of the triac S, it does not operate symmetrically. For example, a BT137E may be used as a triac S. At a positive control of the gate g of this triac S, a trigger current of 10 mA is required in the gate g of the triac S so as to switch on the triac S if the terminal T2 of the triac S is positive with respect to the terminal T1 of the triac S. The trigger current must be 25 mA if the terminal T2 is negative with respect to the terminal T1. If the triac S is negatively controlled at its gate g, a gate current of 10 mA will always be sufficient to trigger the triac, independently of the fact whether the terminal T2 is positive or negative with respect to the terminal T1. In fact, this asymmetry need not be a problem upon positive control, provided that the gate current is always higher than 25 mA. However, it is then important to build up the degaussing arrangement for supplying a constant gate current as is shown in Fig. 3. However, in connection with dissipation, it is advantageous to be able to control the triac S with a minimal gate current. The arrangements shown in Figs. 1 and 2

supply a gate current which decreases as the voltage across capacitor C38 increases. At a positive control of the gate g of the triac S, the negative degaussing currents through the triac S will be eliminated much more rapidly than the positive currents, as is illustrated in Fig. 4. At a negative control of the triac S, this asymmetrical effect is reduced but has still not disappeared completely, due to small differences between the voltages during a positive and a negative mains cycle. A desired result is achieved if the gate g is controlled by means of both a negative voltage and a sufficiently large current.

Due to a capacitive coupling of the display tube with the degaussing coil Ld, steep voltage spikes are produced across the degaussing coil Ld and hence also across the triac S during internal flashes in the display tube. Also in the case of mains spikes, steep voltage spikes are produced across the triac S. These steep voltage spikes may trigger a triac S which is switched off, so that a large current flows through the degaussing coil Ld during half a mains period. To prevent this, a capacitor C1 is arranged parallel across the triac S. A resistor R1, which limits the current through the triac when this triac becomes conducting while C1 is still charged, is arranged in series with this capacitor C1.

Fig. 5 shows another degaussing arrangement according to the invention. A second detection circuit 10 receives the AC voltage Vac and supplies a second control signal Cs2 to an initializing circuit 20 and possibly a third control signal Cs3 to a time-determining circuit 30 and to a first detection circuit 40. The second control circuit Cs2 becomes active when the AC voltage Vac is switched on or increases (for example, by switching on a mains switch or by restoring the mains voltage after a mains dip). The initializing circuit 20 applies an initializing signal I to the time-determining circuit 30. An active initializing signal I brings the time-determining circuit 30 to an initial state. The time-determining circuit 30 subsequently starts the generation of a measure M for time (for example, a charge across capacitor or a count) in response to the third control signal Cs3. By virtue of the fact that the second control signal Cs2 becomes active, the time-determining circuit 30 can deduce that a desired period of time should be generated after the initializing action, while the third control signal Cs3 is then not necessary. The first detection circuit 40 switches on the triac S at a given time measure M which is representative of the increase of the mains voltage, hence the time measure M which occurs at or just after the initialization; or the triac S is switched on in response to the third control signal Cs3. The first detection circuit 40 switches off the triac S if the time measure M has a value which is representative of a given period of time which has elapsed after the increase of the AC voltage Vac. The triac S has then been switched on for the given period of time. It is desirable that only after a

mains interruption which does not have a short duration, the second detection circuit 10 first initializes the time-determining circuit 30 in response to the increase of the AC voltage Vac and subsequently starts the degaussing action. At a mains dip of short duration, the degaussing action should be further continued (as explained hereinbefore). For example, the time-determining circuit 30 comprises the capacitor C38 and the charge resistors R29, R28 as shown in Figs. 1 and 2; or the capacitor C3 and the resistor R5 as shown in Fig. 3. For example, the detection circuit 40 comprises the transistor T41 (Fig. 1 and Fig. 2) or the transistor T4 (Fig. 3). The initializing circuit 20 may comprise the transistor T43, the resistors R23, R30, R22 and R24, the capacitor C35 and the diode D35 as shown in Fig. 2; or the transistors T2 and T3, the resistors R9 and R10, the capacitor C4 and the diode D4 as shown in Fig. 3. For example, the second detection circuit 10 may comprise a circuit which ascertains whether the AC voltage Vac has an amplitude which is larger than a given value. A further circuit generates the second control signal Cs2 if the amplitude of the AC voltage exceeds the given value. The second detection circuit 10 may further comprise a circuit for detecting whether the amplitude has been below the given value for a longer period of time (longer than a short mains dip of approximately 20 to 100 ms). Only in this case the second control signal Cs2 will be activated. It is also possible that the second detection circuit 10 always activates the second control signal if the AC voltage Vac exceeds the given amplitude value. The time-determining circuit 30 is then adapted to initialize or not initialize, dependent on the time measure. When a short mains dip occurs during an active degaussing action, the time measure is not the initial value (which is produced by initialization) and not the final value (which occurs at the end of the degaussing action after the given period of time has elapsed). Based on the time measure, it can thus be decided not to start a new degaussing action but to finish the existing action. When a short mains dip occurs after a degaussing action has finished, the time measure has the final value and the time-determining circuit 30 does not start a degaussing action. In this case it is assumed that the time-determining circuit 30 no longer receives any power supply voltage after a long mains dip and that the time measure assumes the initial value again. An initializing signal I which becomes active results in a degaussing action in the latter situation.

It is to be noted that the embodiments described above elucidate rather than limit the invention and that those skilled in the art will be capable of supplying alternative embodiments without departing from the scope of the appendant claims. Reference signs between brackets included in the claims should not be explained as a limitation of these claims. The control of the triac S disclosed in the invention is also usable in all applications

where a triac S must be switched off in a symmetrical manner after a given period of time. The degaussing circuit could generate the desired period of time also in a digital manner, for example, by means of a counter. Instead of discharging a capacitor C3 after performing a degaussing action, the counter is brought to a starting state. It is further possible to perform said detections and determine the period of time by means of a suitably programmed microprocessor. It is often desirable to realize a very small residual current. This is possible by providing a second thermistor which is thermally coupled to the PTC for heating this PTC. The second thermistor may have a positive temperature coefficient and be arranged parallel to a power supply source, as mentioned previously. The second thermistor may have a negative temperature coefficient and be arranged in series with a load which is present in a picture display device. Instead of the PTC, circuits may also be used which cause a large starting current to decrease to a residual value, such as a damped resonant circuit of which the degaussing coil forms part. Also in these cases, it may be desirable to switch off a residual current flowing in the degaussing circuit. Moreover, the degaussing coil may consist of a plurality of series or parallel arranged sub-coils.

CLAIMS:

1. A degaussing arrangement comprising a series circuit, coupled between terminals of an AC voltage source (Vac), of a degaussing coil (Ld), current-determining means (P1) for determining a starting current through the degaussing coil (Ld) and for subsequently causing a current (Id) through the degaussing coil (Ld) to decrease to a residual value, a switching element (S) for interrupting the current (Id) in the degaussing coil (Ld), and a controlcircuit (200) for switching off the switching element (S) after a given period of time has elapsed after presentation of an AC voltage supplied by the AC voltage source (Vac), characterized in that

the switching element (S) also interrupts a current through the current-determining means (P1),

the switching element (S) comprises a triac (S) having a control input (g),

the control circuit (200) is adapted to apply a control signal (Vc) to the control input (g), the control circuit (200) receiving the AC voltage (Vac) for activating the control signal (Vc) in response to an increase of the AC voltage (Vac) for the purpose of rendering the triac (S) conducting, and in that

the control circuit (200) comprises a time-determining circuit (C38; C3; 30) for maintaining the triac (S) conducting for a given period of time.

2. A degaussing arrangement as claimed in Claim 1, characterized in that the given period of time lasts so long that the current (Id) through the degaussing coil (Ld) has reached the residual value.

3. A degaussing arrangement as claimed in Claim 1 or 2, characterized in that a first state of the time-determining circuit (C38; C3; 30) starts to change from the instant when the AC voltage (Vac) increases, and in that the degaussing arrangement further comprises a detection circuit (T41; T4; 40) which initiates switch-off of the triac (S) when a second state of the time-determining circuit (C38; C3; 30) is reached, the time elapsed between the first state and the second state being the given period of time.

4. A degaussing arrangement as claimed in Claim 3, characterized in that the time-determining circuit (C38; C3; 30) comprises a capacitor (C38, C3), a first charge state of which starts to change from the instant when the AC voltage (Vac) increases, and in that the detection circuit (T41; T4; 40) supplies a control signal (Vc) for initiating the switch-off of the triac (S) when a second charge state of the capacitor (C38; C3) is reached, the time elapsed between the first charge state and the second charge state being the given period of time.

5. A degaussing arrangement as claimed in Claim 3, characterized in that the degaussing arrangement further comprises an initializing circuit (T43; T2, T3; 20) which brings the time-determining circuit (C38; C3; 30) to the first state after the triac (S) is switched off.

6. A degaussing arrangement as claimed in Claim 3, characterized in that the degaussing arrangement further comprises:

a second detection circuit (10) for supplying a second control signal (Cs2) in response to the detection of an increase of the AC voltage (Vac), and

an initializing circuit (T43; T2, T3; 20) which, in response to the second control signal (Cs2), brings the time-determining circuit (C38; C3; 30) to the first state before the triac (S) is switched on.

7. A degaussing arrangement as claimed in Claim 1, characterized in that the demagnetizing arrangement is adapted to control (T1) the control input (g) of the triac (S) from a negative voltage (-Vb) with a current having a value which is large enough to obtain a substantially symmetrical conductance behaviour of the triac (S) for positive and negative periods of the AC voltage (Vac).

8. A degaussing arrangement as claimed in Claim 1, characterized in that the time-determining circuit (C38, C3; 30) generates the given period of time in conformity with a thermal time constant of the current-determining means (P1) in series with the degaussing coil (Ld).

9. A degaussing arrangement as claimed in Claim 1, characterized in that a capacitor (C1) is coupled between the terminals (T1, T2) of the triac (S).

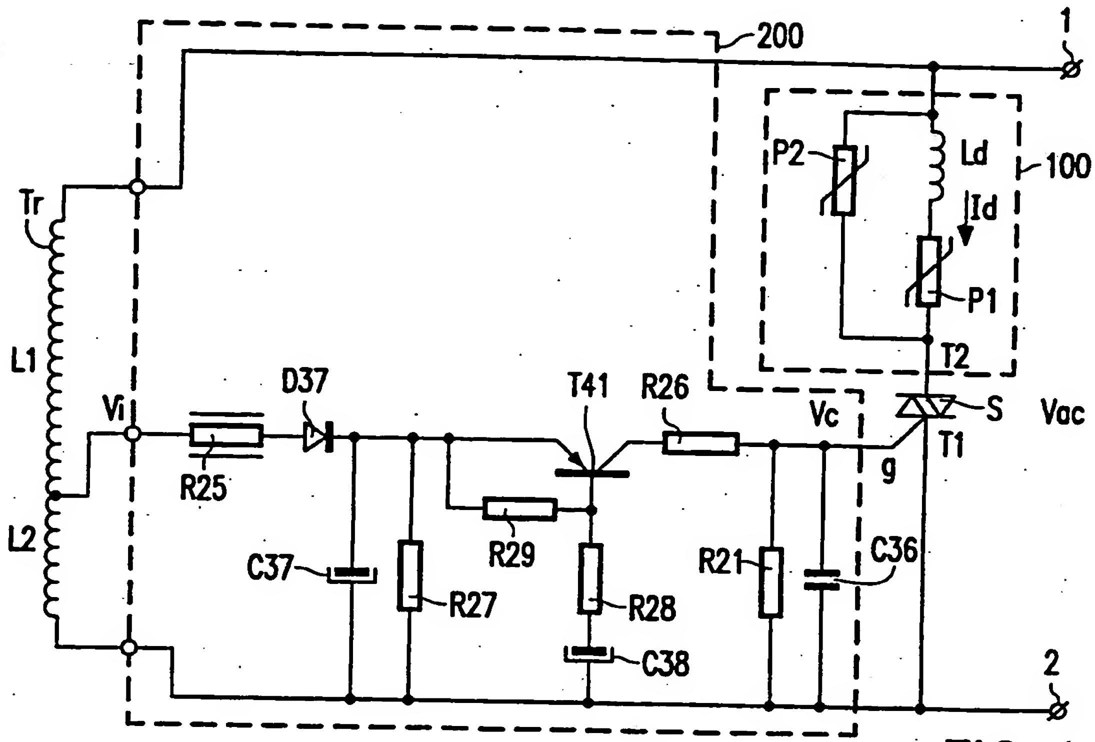
10. A display device provided with a display tube, a degaussing arrangement comprising a series circuit, coupled between terminals of an AC voltage source (Vac), of a degaussing coil (Ld), current-determining means (P1) for determining a starting current through the degaussing coil (Ld) and for subsequently causing a current (Id) through the degaussing coil (Ld) to decrease to a residual value, a switching element (S) for interrupting the current (Id) in the degaussing coil (Ld), and a control circuit (200) for switching off the switching element (S) after a given period of time has elapsed after presentation of an AC voltage supplied by the AC voltage source (Vac), characterized in that

the switching element (S) also interrupts a current through the current-determining means (P1),

the switching element (S) comprises a triac (S) having a control input (g),

the control circuit (200) is adapted to apply a control signal (Vc) to the control input (g), the control circuit (200) receiving the AC voltage (Vac) for activating the control signal (Vc) in response to an increase of the AC voltage (Vac) for the purpose of rendering the triac (S) conducting, and in that

the control circuit (200) comprises a time-determining circuit (C38; C3; 30) for maintaining the triac (S) conducting for a given period of time.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1
100
Tr
P2
Ld
Id
P1
L1
T2
D37
T41
R26
Vi
Vc
S
Vac
T1
g
R25
L2
R29
R21
C36
C37
R27
R28
C38
2

FIG. 1

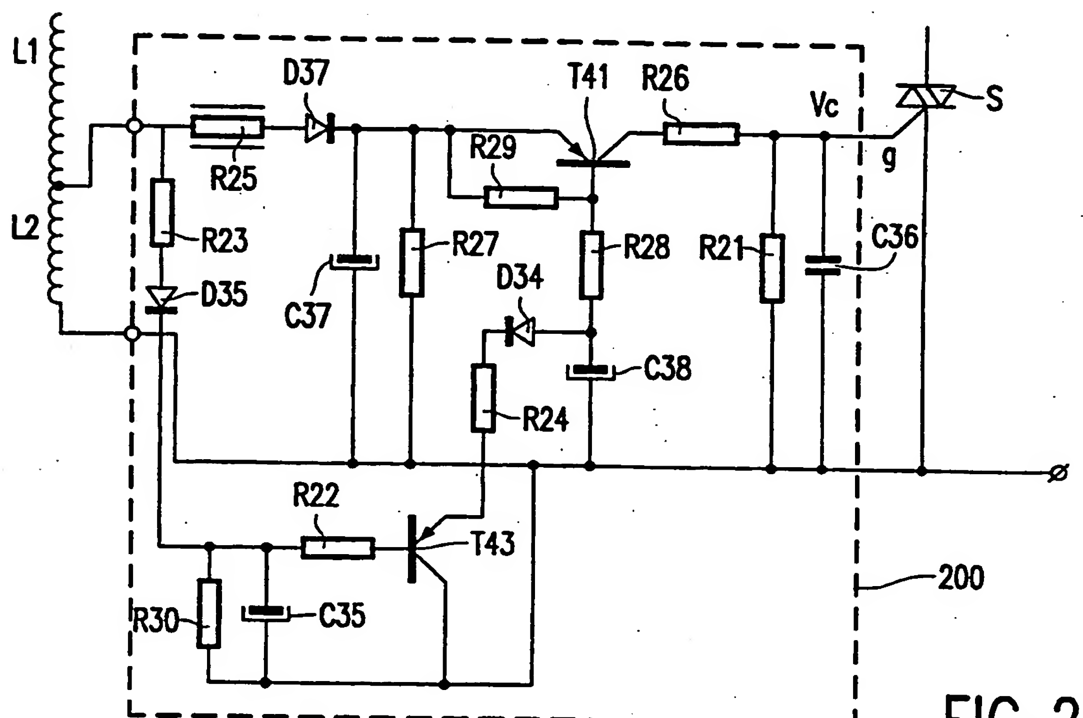
L1
D37
T41
R26
Vc
S
g
R25
R29
L2
R23
R27
R28
R21
C36
D35
C37
D34
C38
R24
R22
T43
200
R30
C35

FIG. 2

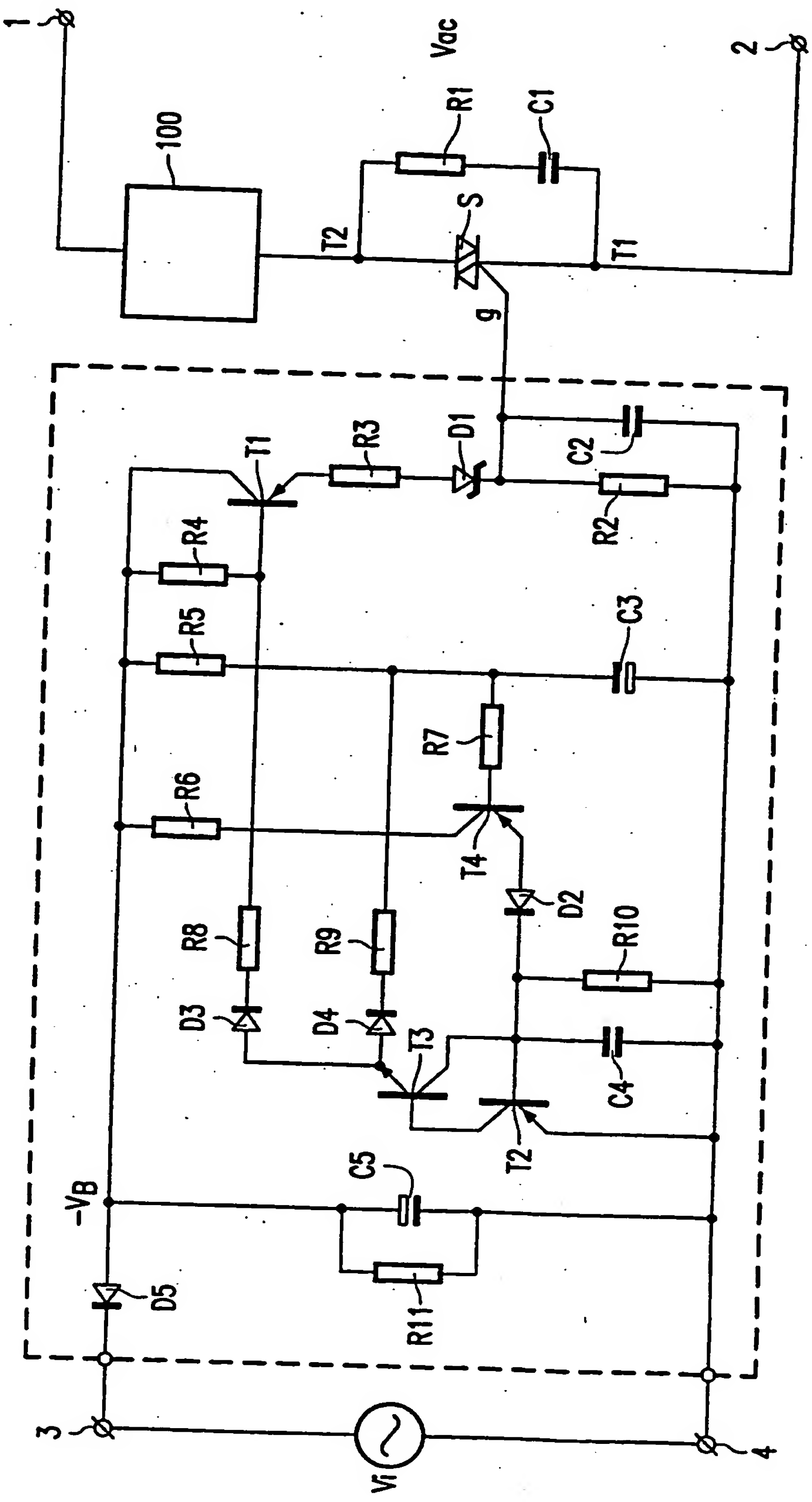
1
2
Vac
R1
C1
100
T2
S
T1
g
T1
R3
D1
C2
R2
R4
R5
C3
R7
R6
T4
D2
R8
R9
R10
D3
D4
T3
C4
T2
C5
$-V_B$
D5
R11
3
4
Vi

FIG. 3

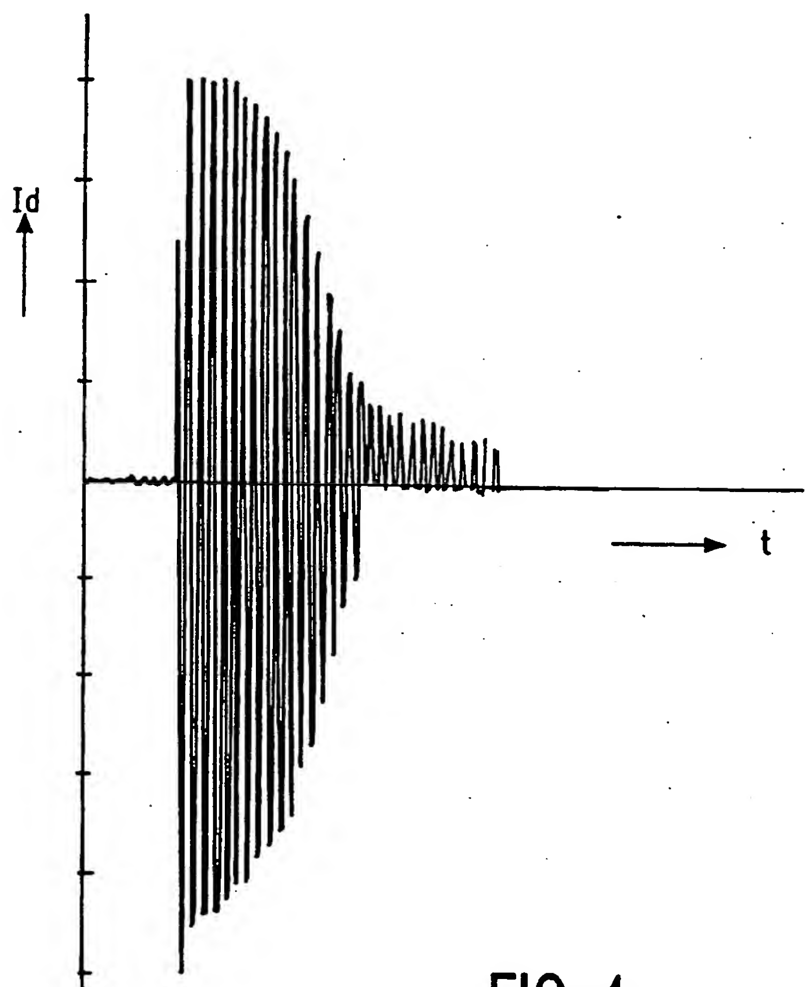

FIG. 4

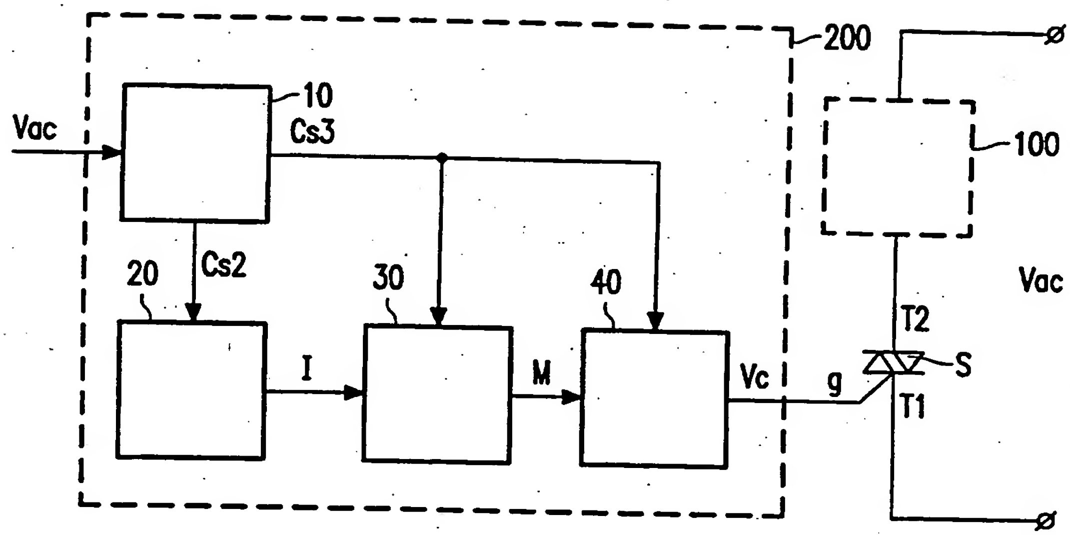

FIG. 5